

Univ. of Arizona

Quarterly Progress Report

NASr-138

October 31, 1965

Piggyback I: UV Camera

A wide-angle lens was acquired for photography of the Milky Way and for a reconnaissance of the sky at 2200 Å. The UV lens has a 1-inch opening and 15 x 22° field. It was provided by Dr. A. Boggess III of the Goddard Space Flight Center through the courtesy of Dr. A. B. Meinel of the Steward Observatory. The lens was mounted on a Nikon camera body, and one of Mr. Pellicori's filters, at 2200 Å, was installed. Tests were made of the performance under environmental conditions and with a variety of films. I O - UV film was adopted. A second Nikon body was purchased as a standby or, when not needed as a spare for the UV, to be used for identification in blue light (blue-corrected lens, blue filter, Tri-X film).

The camera has 90 mm focal length and the photographic resolution therefore is about 1 arcminute. Ideally then the camera should be flown on the POLARISCOPE 28-inch which provides better than 1 arcminute stabilization (peak to peak, during several hours of operation). On the NCAR gondola, that has stabilization to  $\pm 1/3^\circ$ , we can, however, make a first reconnaissance with short exposures. Both cameras are mounted on one side of the polarimeter and the exposures are commanded individually through the NCAR command package.

Piggyback II: IR Detector

Dr. Frank Low provided a Germanium bolometer, cooled with liquid helium, and associated electronics. His package was mounted on the other side of the polarimeter and the output is transmitted through the NCAR telemetry package.

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Low's experiment is to measure the background radiation in various directions and, hopefully, obtain the temperature of the universe. The singular-origin of the universe ("big bang" theory) would be followed by a decreasing temperature that presently has reached about  $3.5^{\circ}\text{K}$  (R. H. Dicke, et al., *Astrophys. J.* 142, 414, 1965). Low's detector has an effective wavelength near 2 mm, which is ideal for detection of  $3.5^{\circ}\text{K}$  as the maximum of the black body curve occurs near 2 mm. However, here again, this experiment is only in the reconnaissance stage. The theory is uncertain as, for instance, the radiation may not be comparable to that of a black body. The greatest experimental hurdle appears to be the radiation of the earth's atmosphere. The high altitude of our present flights (116,000 feet), therefore, is ideal for Low's experiment. We shall in future flights go higher yet.

#### Launch Attempt of 15 September 1965

Once per month we usually have a limited window available for launch. The primary experiment is lunar polarimetry, and appreciable polarization of the moon occurs between 40 and 140 degrees phase. The smaller crescents occur when the moon is up in the daytime which is, because of scattered sunlight, prohibitive to the moon tracker and to the UV detectors. The phase range for suitable flight therefore is limited to  $40-100^{\circ}$  phase. In order to have the smallest ozone extinctions the moon must be high in the sky and certain occasions of  $40-100^{\circ}$  phase are thereby eliminated. (In fact, we often have the moon so high that during part of the planned flight the moon is behind the balloon.)

A suitable window occurred September 13 - 18, 1965, and Bishop, Gehrels, Harber, Low, Pellicori and Shipley, went to Palestine with all the equipment. The

telemetry trailer was positioned 200 miles downwind, at Brownwood, Texas, with Gehrels and Pellicori in charge. On 15 September at about 6 p.m., a calm in the ground winds occurred and the balloon was inflated. However, just before the planned launch, a sudden gust of wind twisted the balloon and tore it. During the remaining nights of the window the weather in Texas was not suitable for flight.

#### Preparations for Next Flight

We are presently working on additional checks and on a decrease of the weight of the systems. Low can save a few pounds, and improve his detector/chopper arrangement somewhat. An improved battery arrangement allows a saving of 25 lbs. As the 28-inch POLARISCOPE system is in the environmental chamber of Hughes Aircraft Corp., it is convenient to subject the polarimeter also to another environmental profile.

The next window occurs November 11 - 16, 1965. The launch is presently planned, with a 4 mi. cu. ft. balloon, from Litchfield Park near Phoenix, Arizona. The second ground station will be positioned near El Paso, Texas.

#### VOYAGER Proposal

A proposal is being written to have a version of the present polarimeter flown on VOYAGER 1971 to Mars. On the way to Mars we wish to intercompare the earth and Mars. Around Mars the polarimeter would remain in orbit, and not be on the entry capsule. The proposed photopolarimetry is an extension of our ground-based and balloon-borne studies of Mars. The proposal will be submitted to NASA by 19 November 1965.

At the end of this contract year, we thank the National Aeronautics and Space Administration for continued support of our efforts.

Tom Gehrels  
31 October 1965  
Tucson, Arizona